ISD Flight Operations Review (FOR) Checklist For Software

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Approved By: (signature)
Name: Barb Pfarr
Title: Assoc. Chief, ISD

Responsible Office: 580/Information Systems Division (ISD)
Title: ISD Flight Operations Review for Software

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The FOR is the second of two reviews that concentrate on the ground system and flight operations preparations.

The FOR reviews the progress of ground systems development and mission operations planning activities and establishes readiness to proceed with final preparations of ground system elements to support successful launch and mission operations. The FOR is held late in the test flow of the flight system but prior to the last major interactive test between the flight and ground system elements. The review is conducted before shipment of flight system elements to the launch site. All mission-oriented operations should be addressed: science, spacecraft and ground system operations.

Use the following checklist to ensure that the proper status information is presented for review and a decision can be made concerning the readiness of the system to go operational. The checklist will require inputs from a wide range of disciplines.

- ❑ **Introduction**
  - ❑ State the goals of this review; review prerequisites, scope, agenda, and products
  - ❑ Introduce the review panel and review process to be followed (e.g., Request for Action (RFA) or Review Item Description (RID) reports, schedule)
  - ❑ Review and provide current status for action items generated at the Mission Operations Review and any other previous software reviews for which action items are still open or their status has changed since previous review.

- ❑ **Mission Overview**
  - ❑ State the purpose and overview of the software project or overall Mission project (e.g., mission goals, mission description, key requirements, instruments, orbit, launch vehicle, operational characteristics)
  - ❑ Describe the software project organization and key personnel, including (if applicable) how the project fits within the overall Mission organization and identification of the project's systems engineers at the Mission Project level
  - ❑ Describe the mission project schedule
  - ❑ List any risks and external dependencies

- ❑ **Ground Systems Readiness**
  - ❑ Show a diagram and describe all the main functionality for the ground systems, how the parts interact, and what the main flow of data is between the major functional parts
  - ❑ Describe driving requirements for the ground systems software including any new requirements.
  - ❑ Describe ground systems organization and key personnel
  - ❑ Describe ground systems architecture showing all major functional parts and data flows. Links to spacecraft should show data rates.
  - ❑ Describe software elements including short description, current status of software, tool status, major issues, impacts, workarounds, and any relevant future plans
    - ❑ Confirm flight software table loads and code patch testing has been successfully completed on all processors demonstrating the operational interfaces between the ground system and any flight software maintenance facilities that will provide software table or code modifications.
    - ❑ Describe anything left to do including any schedule impact, workarounds, and risks
  - ❑ Describe current Discrepancy Report status, include historical trend data, and details on current open Discrepancy Reports
  - ❑ Describe current Enhancement Report status, include historical trend data, and details on current open Enhancement Reports

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- ❑ **Ground Systems Readiness** (continued)
  - ❑ Describe current Database Change Request status, include historical trend data, and details on current open Database Change Requests
  - ❑ Summarize all testing done, results, and outstanding issues.

- ❑ **Flight Systems Readiness**
  - ❑ Describe driving requirements for the flight software including any new requirements.
  - ❑ Describe flight software organization and key personnel
  - ❑ Describe flight software architecture showing all major functional parts and data flows.
  - ❑ Describe software elements including short description, current status of software, tool status, major issues, impacts, workarounds, and any relevant future plans
    - ❑ Describe anything left to do including any schedule impact, workarounds, and risks
  - ❑ Describe current Discrepancy Report status, include historical trend data, and details on current open Discrepancy Reports
  - ❑ Describe current Enhancement Report status, include historical trend data, and details on current open Enhancement Reports
  - ❑ Describe current Database Change Request status, include historical trend data, and details on current open Database Change Requests
  - ❑ Summarize all testing done, results, and outstanding issues.

- ❑ **Flight Dynamics Facility (FDF) Readiness**
  - ❑ Show a diagram that describes the main functionality for the FDF, how the parts interact within the FDF and the other parts of ground systems, and what the main flow of data is between the functional parts.
  - ❑ Describe the Operational Readiness of the FDF software for this project. Include name, functionality, and what testing supports this readiness.
  - ❑ Describe anything left to do including any schedule impact, workarounds, and risks

- ❑ **Flight Software Maintenance Facility Readiness**
  - ❑ Describe all outstanding items that need to be completed before readiness is achieved along with scheduled dates, workarounds, and risks.
  - ❑ Confirm flight software table loads and code patch testing has been successfully completed on all processors, including all possible on-board media (e.g., RAM, EEPROM).

- ❑ **Science Planning and Processing System Readiness**
  - ❑ Describe driving requirements for the science software including any new requirements.
  - ❑ Describe science software organization and key personnel
  - ❑ Describe science software architecture showing all major functional parts and data flows.
  - ❑ Show a diagram that describes the Science System Content (relationship of main Mission Operations Center, Mission Planning Office, Science Validation Facility, Ground stations, interconnecting networks, and the main science data Instrument teams.
  - ❑ Describe these main components in high-level detail including the planning and processing functions. Include any special cases for launch, in orbit checkout, end of mission, etc. Describe testing, results, and issues that have been done to verify and validate these components.
  - ❑ Describe anything left to do including any schedule impact, workarounds, and risks.

- ❑ **Sustaining Engineering Readiness**
  - ❑ Describe plans for spacecraft (including instruments) software engineering support in the post-launch period including the Maintenance Plan, key personnel, facilities, current status, training, org chart, schedule, outstanding problems and proposed resolutions, and risks.
  - ❑ Describe plans for ground systems software engineering support in the post-launch period including the Maintenance Plan, key personnel, facilities, current status, training, org chart, schedule, outstanding problems and proposed resolutions, and risks.
  - ❑ Describe plans for flight systems software engineering support in the post-launch period including the Maintenance Plan, key personnel, facilities, current status, training, org chart, schedule, outstanding problems and proposed resolutions, and risks.

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- ❑ **Mission Readiness Testing**
  - ❑ Describe results of spacecraft operations tests, modifications, verifications, and validations.
  - ❑ Describe results of Mission Readiness Tests, modifications, verifications, and validations.
  - ❑ Describe results of End-to-End Tests, modifications, verifications, and validations.
  - ❑ Describe anything left to do including any schedule impact, workarounds, and risks.

- ❑ **Simulations**
  - ❑ Describe use of simulators, their capabilities, problems and resolutions by subsystem exercised. Simulations should be run for normal, L&EO, special, and contingency operations.
    - ❑ Launch
    - ❑ Altitude Control System
    - ❑ Command & Data Handling
    - ❑ Communication
    - ❑ Flight Software
    - ❑ Power System Electronics
    - ❑ Mission Operations Center
    - ❑ Pre-Launch
    - ❑ Others (list any others deemed important for project)
  - ❑ Describe any remaining outstanding issues from Simulation testing, schedule impacts, and risks.

- ❑ **Safety and Security Issues**
  - ❑ Describe software issues with safety, how they have been addressed, and their current status
  - ❑ Describe software issues with security, how they have been addressed, and their current status

- ❑ **Contingencies and Constraints**
  - ❑ Describe the state of the Contingency Flow Chart Book and any planned updates.
  - ❑ List the current constraints on the system, the state of the database that details these constraints, and any outstanding actions that need to be taken.
  - ❑ Describe any audits that were done and against what areas to verify constraints.
  - ❑ Describe the operational problem escalation process.
  - ❑ Describe the operational emergency notification process including telephone numbers to be called.
  - ❑ Describe anything left to do including any schedule impact, workarounds, and risks.

- ❑ **Lessons Learned**
  - ❑ Describe captured Lessons Learned from software areas of the project. Indicate the problem of success that generated the Lesson Learned, what the Lesson Learned was, and it's applicability to future projects.
  - ❑ Confirm that the Lessons Learned have been add to the GSFC Lessons Learned database.

- ❑ **Work Remaining**
  - ❑ Describe and list all launch critical work that needs to be completed before launch along with the expected completion data.
  - ❑ Review any RFA and RID reports generated as a result of this FOR.

- ❑ **Conclusion**
  - ❑ Summarize of status for Operational Readiness
    - ❑ Ground Systems
    - ❑ Flight Systems
    - ❑ Science Systems
    - ❑ Documentation including contingency book readiness
    - ❑ Operational support and maintenance support plans
    - ❑ Configuration control procedures
    - ❑ Waivers
    - ❑ Issues

Change History

Version	Date	Description of Improvements
1.0	4/24/06	Initial approved version by CCB